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ABSTRACT

Two experiments concerned with memory and comprehension of prose passages were conducted with children from second through seventh grade. In both experiments the major variable was the provision of appropriate frameworks for comprehending ambiguous sections of the passages. In the initial experiment, recognition of theme-congruent and theme-incongruent foils was the main measurement, while, in the second experiment, intrusions in recall and postrecall interviews were used to measure the influence of preexisting expectations on story comprehension and recall. The main effect was the striking absence of developmental trends: children behaved like adults in both the recall and recognition studies. Recall of ambiguous passages was enhanced if a relevant framework was given, intrusions reflected the prior orientation, and the subjects had difficulty distinguishing between their own embellishments and the actual story content. Under recognition conditions, children treated theme-congruent foils as if they were target items and incongruent foils as if they were distractors. It is argued that, for children as well as for adults, schemata provide the interpretive framework for comprehending discourse. (Author)

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CENTER FOR THE STUDY OF READING*

Technical Report No. 13

INTRUSION OF A THEMATIC IDEA IN CHILDREN'S COMPREHENSION AND RETENTION OF STORIES

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Intrusion of a Thematic Idea in

Children's Comprehension and Retention of Stories

Comprehension of discourse involves more than the application of specific linguistic knowledge for the ability to extract meaning from a message depends on the relation between the current input and the immediate cognitive-perceptual situation (Brown, 1975; Bransford & Nitsch, 1976). Every act of comprehension involves background knowledge of the world and it is the preexisting knowledge structures which are brought to the text that enable the reader to comprehend the significance of a message. Such knowledge structures have been referred to variously as schemata (Bartlett, 1932; Bobrow & Norman, 1975; Kant, 1781; Rumelhart & Ortony, 1977), scripts (Nelson, 1977; Schank & Abelson, 1975), and frames (Minsky, 1975; Winograd, 1975).

Preexisting knowledge schemata function to orient people to interpret a message in a certain way (Anderson, Reynolds, Schallert & Goetz, 1976; Bransford, Nitsch & Franks, 1977), and this is certainly true when the message is conveyed by text. Texts are never fully explicit and the reader must rely on preexisting knowledge to disambiguate situations, to fill gaps, to incorporate the unfamiliar into the familiar, and to provide a plausible interpretation for the ambiguous or vague. Thus, a reader's personal history, knowledge, and belief systems will influence the interpretation that is given to a passage.

Any history of prose comprehension and memory must take as a focal point the pioneering work of Sir Frederick Bartlett (1932). Briefly, Bartlett's findings concerning prose recall can be summarized in three main points. The first and major finding was that an extraordinarily high

proportion of inaccuracies occurred in recall protocols. These inaccuracies consisted of more than just omissions and condensations which might follow from simple memory failure: rather, they resulted just as much from radical transformation of the original material as from simple omission. Major themes were embellished, emphasized, and rationalized (sharpening) while irrelevant material was condensed or discarded (levelling). Furthermore, novel material was introduced, material which reflected the interests, biases, and knowledge systems of the purveyors of the stories and often served to elaborate, rationalize, or connect into a unified whole, key elements of the theme. Second, the extent of these embellishments, rationalizations, and importations of novel elements increased over time. Third, subjects appeared to be totally unaware of the extent of their inaccuracy and had difficulty discriminating material they had added or changed from material they had actually seen or heard. On the basis of these data Bartlett concluded that the form of remembering involved in prose regeneration could in no sense be regarded as the revival of an earlier experienced event or the 're-excitation of a fixed lifeless fragmentary trace." Thus, Bartlett failed to endorse the then dominant "reappearance hypothesis" theory of memory (Neisser, 1967) whereby a directly experienced event is stored, later to reappear, as a true (albeit faded) copy of the original. Instead Bartlett supported the idea of memory as an active reconstructive process involving the entire knowledge system of the individual (Brown, 1975, 1976, 1977).

Although there have been many, largely unsuccessful, attempts to replicate Bartlett's findings (Zangwill, 1972), it was not until comparatively recently that we have come to understand the necessary conditions

for producing the type of phenomena recorded by Bartlett (Spiro, 1977). Intrusions and disambiguations are most likely to occur when there is a significant interaction between preexisting knowledge and the text. Under conditions of an immediate test of straightforward material, with instructions to maintain accuracy, Bartlett's findings cannot usually be replicated. However, there is little reason why they should. Given readily understood material in an experimental situation there is little reason to reinterpret the material according to one's own preconceptions. If one is interested in the influence of the subject's knowledge and beliefs on his memory of events, some attempt should be made to manipulate the interaction between the material and the subject's experience. When this is done a different pattern emerges.

Attempts to manipulate the schematic knowledge used by subjects in remembering have utilized two kinds of ambiguous passages. For example, Sulin and Dooling (1974) used passages open to several interpretations. The subjects read short biographical passages which could be about either famous or fictitious people (Adolf Hitler and Helen Keller vs. Gerald Martin and Carol Harris). Subsequently, those subjects led to believe that the passages were about the famous characters made more false positive errors, recognizing new items as old, when the items were congruent with their preexisting knowledge concerning the central character. Similarly, Schallert (1976) constructed passages that had more than one interpretation (e.g., problems of a baseball team manager vs. problems of a glassware factory manager) and found that for those subjects processing the passages at a semantic level information recalled was consonant with the context provided by the title given to the passage. In these two studies preexperimental

knowledge concerning the context assigned to the passage did affect retention.

Another type of ambiguous passage is one in which the message is unclear or seemingly nonsensical to the learner until a title or theme is provided. For example, Bransford and Johnson (1973) and Dooling and Lachman (1971) furnish dramatic examples of the influence of providing an appropriate context for ambiguous passages concerning familiar activities such as washing clothes, making and flying a kite, and Christopher Columbus discovering America. These studies provide strong support for constructive theories of memory such as Bartlett's. Apparently, systematic contortion and embellishments do occur if the material is open to several interpretations or its meaning is unclear in some way, and these constructive changes are predictable from the preexisting knowledge and beliefs of the learner.

If memory for stories involves an active constructive process involving the total knowledge system of the subject, the developmental implications are most interesting, for there must be an intimate relation between what the child can understand and what he can reconstruct at any particular point in his development. However, there have been few attempts to examine the relation between the child's level of cognitive development and his comprehension or memory. In addition, there have been very few studies of memory for any form of narrative materials in children (Brown, 1977), although one of the earliest psychological experiments with children did focus on memory for prose (Binet & Henri, 1894). In the present paper we are particularly interested in whether young children comprehend and subsequently reconstruct a story in relation to their preexisting knowledge, that is, are able to make use of foregrounding information (Chafé, 1972) in the same manner as adults.

Two experiments were conducted; both involved providing differing background information which could be used to disambiguate and elaborate vague or ambiguous sections of prose passages. In the first experiment children were given a passage concerning an escape; half the children were led to believe that the central character was an escaped convict while the remainder were told that the escapee was the chimpanzee hero of the television program, Planet of the Apes. In the second experiment all children were given the story of Tor, a member of the fictitious Targa Tribe. Some of the children had previously encountered the Targa as Eskimos, some as desert Indians and the remainder had no prior information concerning the tribe. In Experiment 1 the major indices of retention were false recognition errors while in Experiment 2 they were intrusions in recall. In both cases, these measures should reflect the biasing conditions if children are susceptible to the assimilative functions of preexisting schemata.

Experiment 1

Method

Subjects. The subjects were 143 students attending public schools in Joliet, Illinois. There were 37 third graders, 47 fifth graders, and 49 seventh graders in the experiment proper plus an additional 10 children at each grade level. To the best of our knowledge none of the subjects had previous experience in a psychological experiment.

Materials. Two stories were tape recorded by the same female native American. The practice story, "Epaminondas", was selected from Piaget (1926). The second story, 'The Fugitive', was written by the authors:

The Fugitive

Galen (George) was alone. He knew they would soon be here. They were not far behind him when he left the village, hungry and cold. He dare not stop for food or shelter for fear of falling into the hands of his pursuers. There were many of them: they were strong and he was weak. Galen (George) could hear the noise as the uniformed band beat its way through the trees not far behind him. The sense of their presence was everywhere. His spine tingled with fear. Eagerly he awaited darkness. In darkness he would find safety.

There were two foil questions for each of the underscored sentences, one congruent with a Galen orientation and the other congruent with a George orientation. The Galen congruent foil for sentence one was: "Galen could hear the noise as the powerful Gorilla army beat its way through the trees." The George congruent foil was: George could hear the noise as the prison guards beat their way through the trees." The Galen congruent foil for sentence two was "his fur stood on end" and the George congruent foil for that sentence was "his flesh crawled."

Each student was seen individually by the same female experimenter. The subjects at each grade level were randomly divided into four groups approximately equal in number, with males and females roughly balanced across groups. All subjects began with a warm-up session that consisted of listening to the practice story, immediately followed by a gist recall. Following this, half the students were told that the next story was about George, an escaped convict trying to break out of prison. The remaining students were told that the next story was about Galen, the friendly chimpanzee hero of the Planet of the Apes television series. As testing took place at the time when this series was being shown on television and

receiving wide publicity, the majority of the children already knew a considerable amount concerning Galen's background. The few children who had not watched the program and could not give a brief description of the theme did not continue to participate in the study.

The four experimental groups were composed of those receiving the Galen orientation and those receiving the George orientation, further subdivided into those who would receive foil questions congruent with their orientation and those who would receive foil questions incongruent with their orientation. Thus, a Galen congruent subject would receive foil questions congruent with his belief that Galen was a chimp escaping from a band of gorillas, but a Galen incongruent subject would receive foils congruent with the escaped convict story, i.e., incongruent with the Galen orientation.

After listening to two repetitions of the target passage the students were given a twenty-two page recognition booklet, each page containing one sentence. The 22 sentences consisted of 8 sentences which had occurred as part of the story and 12 distractor sentences. In addition, there were the two critical foil sentences, congruent for half the subjects and incongruent for the remainder. The sentences of the story and the foil sentences occupied the same temporal position as they had in the story for half the subjects but were randomized for the remainder.

The distractors were randomly interpersed among the target sentences. They consisted of six completely unrelated items (e.g., 'The ship sailed in the harbor," "George (Galen) ate the apple") and six judged by independent college students to be thematically related to the story. Three were rated as low related (e.g., The air was cold and crisp in the forest"), and three

were rated as moderately related (e.g., 'His body ached he was so tired from his exertions").

The students and the experimenter went through the booklet page by page and either the child or the experimenter read the sentence aloud. The child was then asked whether the sentence was exactly like a sentence he had heard in the story or a little different. After indicating his yes (alike) or no (different) response, the child was asked to indicate his confidence in his response by sticking a yellow 'smiley" sticker next to his answer if he were sure, or a brown 'frowning face if he were not certain of his response.

The second part of the testing also used a recognition booklet. All children received the same book containing eight 3-choice recognition items. Six of the items consisted of one target sentence that had actually occurred in the story, a related distractor, and an unrelated distractor. The two critical items consisted of the target critical item and the two foils, the George and Galen congruent foils. The order of the three sentences within an item was counterbalanced across subjects as was the order of items within the book, with the restriction that the two critical items did not occur (a) as the first item, or (b) adjacently in the booklet. Again the experimenter or the child read aloud the three sentences for each item and the child was asked to choose a sentence which was exactly like one heard in the story.

The additional ten children of each grade who had not taken part in the first recognition test were tested for gist recall of the story content, approximately 5 minutes after listening to the story. In the intervening time period they worked to solve wooden puzzles. After attempting recall these children also took the second (forced-choice) recognition test.

Results

No differences were found between those children who received the recognition questions in a scrambled order and those who were given the questions in the order they had occupied in the story. Therefore, the data were collapsed across this variable. The children's responses to each of the 22 questions in the first recognition booklet were coded on a 4-point scale with a yes-sure response scored as 4, a yes-unsure response as 3, a no-unsure response as 2, and a no-sure response as 1. Scores for the various types of distractors and target items will be considered separately.

First consider the target items, those that actually occurred in the story. A mean score of 4 would indicate perfect yes-sure responses, i.e., perfect accuracy. Analyses of variance of the mean scores as a function of Age and Condition revealed no significant differences. The mean score for all subjects was 3.88 and the range of scores was from 3.84 to 3.93. All subjects at each grade level and in each condition approximated a perfect score. Children are very sure that they have seen the target items before and there are no developmental differences, although, of course, there is a ceiling effect.

Next consider the distractor items, those sentences that did not occur in the text but were previously scaled in terms of their relatedness to the theme of the passage. There were three levels of relatedness: none, low, and moderate. The mean scores as a function of relatedness were entered into a 3 (Grade) x 3 (Level of Relatedness) mixed analysis of variance. The main effect of distractor relatedness was reliable, F (2,260) = 36.12, $p < .001$. The mean score for the no relation items was 1.02 indicating near perfect

rejection (no-sure responding). The means for the two related levels were 1.12 and 1.29 for low and moderate relatedness, indicating that subjects still responded "no" to these items but their degree of certainty was weakened as the relatedness to the theme increased. There was no effect of Age and the Age x Relatedness interaction was not signficant.

Next consider the critical probe items which varied in terms of congruity to the setting story. The mean ratings on the critical probe items were subjected to a 3 (Grade) x 2 (Story) x 2 (Congruent/Incongruent) x 2 (Item 1 and 2) mixed analysis of variance. The main effect of Congruity was reliable, F (1,121) = 117.33, p < .001. The mean rating when an item was congruent with the child's expectations was 3.1 compared with 1.27 when it was incongruent. The main effect of Item (1 and 2) was also reliable, F (1,121) = 9.67, p < .01; item 1 produced a mean rating of 2.35 and item 2 produced a rating of 2.07. Of more interest is the significant Item x Congruity interaction, F (1,121) = 7.23, p < .01. Although there was no difference between items 1 and 2 under the incongruity condition (1.30 and 1.25 respectively) there was a difference under the congruity condition. Item 1 produced mean ratings of 3.4 but item 2 produced ratings of 2.92. This suggests that the foils for the first item concerning the noise made by the uniformed band were thematically better than the foils for the second item concerning the spine tingling with fear. More children were misled by the congruity variable when "prison police" or "garilla army" was substituted for the "uniformed band" than when "fur stood on end" or "flesh crawled" was substituted for "spine tingled with fear." Of course the second foil involved more surface changes to the sentence than the first. Although this item effect illustrates the problem of selecting suitable foils, it should

be noted that even with the less successful foil the subjects treated the sentence as a yes response even though their confidence was weakened.

In general it can be said that when a critical probe is incongruent with the setting theme it is rated as if it were an intrusion, a moderately related distractor item (scores of 1.29 for moderately related distractors and 1.27 for critical items in the incongruent condition). If the critical item is congruent with the theme it is rated as if it were a target item although with somewhat weakened confidence (target item = 3.88, critical foils = 3.40 and 2.92). The subjects falsely recognized the critical foils only if they were congruent with the orientation they had received, but not otherwise. Again there were no effects of age.

The second recognition test consisted of a choice between three alternative sentences. For six of the items the choices were between an actual target sentence, a related distractor, and an unrelated distractor. Performance was almost errorless on this item with a .99 probability of correct choice. No effects of age and condition were found. In addition, there were no differences between the forced choice recognition accuracy of those children who received the original recognition test or those who attempted recall of the story prior to this second recognition test.

Next consider the two critical items of the forced choice recognition test. These consisted of the three versions of the critical probe sentences, the actual story line, the George congruent foil, and the Galen congruent foil. Here there was an effect of age as the proportion of children who falsely recognized the congruent version decreased with age. On item 1, the proportion choosing the congruent item decreased from .67 at grade 3 to .26 at grade 5 and .08 at grade 7 ($X^2_{(2)} = 16.79$, $p < .001$). On item 2,

there was a similar decrease from .50 at grade 3, through .26 at grade 5 to .00 at grade 7{ $X^2_{(2)} = 7.37$, $p < .001$}. All subjects not choosing the congruent items chose the actual story line. Even though there were no age differences between susceptibility to foil items in the yes/no recognition test when only one alternative was present, older children can discriminate between the actual items and congruent foils when faced with both versions. Younger children are not so sensitive.

The final data of interest are the recall scores of the ten children at each grade level who recalled the stories. We calculated the number of intrusions and the number of actual units which were included in the recall protocols. The proportion of intrusions to actual units was low, approximately 10%, and did not vary as a function of age. The intrusions were then given to separate judges who used a blind rating procedure to rate the items in terms of their relatedness to the Galen or George theme. Of the intrusions the majority were judged to be related to the theme to which the child had been exposed. For those subjects who received the George theme, the proportion of intrusions which were rated as George related were .64, .65, and .76 for grades 3, 5, and 7 respectively. Similarly, for those children in the Galen condition, the proportions of Galen relevant intrusions were .58, .72, and .76 for grades 3, 5, and 7. This increase in relevant intrusions as a function of age was reliable, $F(2,54) = 3.40$, $p < .05$. Although children of all ages produce few intrusions, the proportion of these intrusions which are relevant to the theme increased as a function of age. Verbatim examples of relevant intrusions are given in Table 1. Irrelevant items included, for example, mention of a forest and confusions such as

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Insert Table 1 about here

"he could hear the band playing the drums and all that." Children's recall was influenced by the frame work in which they were encouraged to place the story.

Discussion

The results of Experiment 1 replicate and extend those found by Sulin and Dooling (1974) with adults. Susceptibility to congruent foils in a recognition test does not appear to be age dependent. All subjects treated congruent foils as target items and incongruent foils as distractors. The only difference between younger and older children's recognition sensitivity occurred on the second recognition test where they were required to choose between the three versions of the critical item, the actual story line, and the incongruent and congruent foils. Older children could discern the original version even set among the two highly similar competing versions. Younger children tended to choose the congruent foil item. This provides some support for the hypothesis that younger children have difficulty keeping separate the actual passage and their background knowledge concerning that passage.

A consideration of the intrusion errors in recall suggests another possible area of developmental change although there were so few intrusions that this evidence is weak. Older children introduced approximately the same amount of intrusions as younger children but the proportion of their intrusions which were theme relevant was significantly higher. An attempt to replicate the finding was made in Experiment 2.

In general, the most striking aspect of these data for a developmental psychologist must be the absence rather than the presence of an age effect

(Brown, 1975). Children at all ages displayed the same basic pattern of results: (a) near perfect recognition of target items, (b) near perfect rejection of distractors, (c) a decline in the confidence of rejecting distractors as their relatedness to the story theme increased, (d) congruent foils treated like target items, and (e) incongruent foils treated as distractors. This pattern of results is very similar to that found with adults (Sulin & Dooling, 1974) and suggests that by third grade, children do use their preexisting knowledge schemata to elaborate and embellish their retention of prose passages.

Experiment 2

The main reason for conducting Experiment 2, in addition to the need for replication across ages, tasks, and stories, was a dissatisfaction with the recognition task as a measure of developmental differences in assimilative processes in comprehension and retention. The manipulation of a few foil sentences may not provide sufficiently sensitive indices of underlying differences in comprehension and assimilation to a theme. Therefore, in the second experiment, free recall and probe questions were introduced in order to evaluate the effects of information on subsequent comprehension.

The recall measure was thought to be particularly appropriate for investigating possible developmental differences. While adults do show theme-revealing disambiguations and intrusions in their recall attempts, these are by no means frequent and investigators have relied upon memory probes (contained in questionnaires) to uncover the reader's interpretation of ambiguous passages (Anderson et al., 1976). However, there is some reason to believe that younger children may provide more intrusions in their recall protocols than adults. Young children tend to "over-elaborate"

(Lesgold, Curtis, DeGood, Golinkoll, McCormick, & Shimron, 1974; Piaget, 1926), that is, when asked to recall the actual text they recall details of the total experience in context and fail to restrict themselves to the actual content of the target passage. Such over-elaboration would produce a greater ratio of imported ideas to actual units in younger children compared with adults who are impeded apparently in their recall elaboration by their effort after accuracy (Spiro, 1976).

However, there is a competing hypothesis. Brown (1975) has suggested that as children mature they become increasingly flexible in their ability to breathe meaning into texts by harnessing relevant background information in their "effort after meaning" (Bartlett, 1932), that is, they employ increasingly more deliberate attempts to impose meaning on ambiguous messages in order to render them more readily comprehensible. From this hypothesis we would predict both better recall and comprehension in the older children and an increase in intrusions and theme-relevant contortions. The third possible outcome is that there are no developmental differences in the effects of providing relevant frameworks for comprehension as long as the frameworks are comprehensible at all ages. This finding would essentially replicate Experiment 1, where the similarity rather than difference between younger and older children was the most striking finding.

Therefore, in Experiment 2, we repeated the main features of Experiment 1 but used recall measures as the method of assessing retention. Anticipating that intrusions may be small in number (Anderson et al., 1976), we also added a post-recall interview to probe the student's understanding of the passage. In addition to providing different relevant frameworks in which to incorporate an ambiguous story, we also added a control condition where no relevant schemata were provided experimentally.

Method

Subjects. The subjects were 90 students selected from grades 2, 4, and 6 of the Troy Elementary and Junior High Schools. There were 30 children at each age level, approximately equal numbers of boys and girls in each group.

Preparation of the materials. As in Experiment 1, the practice passage used was Piaget's Epaminondas story. The target passage was written by the authors.

Tor of the Targa

Tor, a young man of the Targa tribe, was out hunting in the ancient hunting territory of his people. He had been away from his village for many days. The weather was bad and he had not yet managed to locate his prey. Because of the extreme temperature he knew he must soon return but it was a matter of honor among his people to track and kill the prey single-handed. Only when this was achieved could a boy be considered a man. Those who failed were made to eat and keep company with the old men and the women until they could accomplish this task.

Suddenly, in the distance, Tor could make out the outline of a possible prey. It was alone and not too much bigger than Tor, who could take him single-handed. But as he drew nearer, a hunter from a neighboring tribe came into view, also stalking the prey. The intruder was older than Tor and had around his neck evidence of his past success at the hunt. "Yes," thought Tor, "he is truly a man." Tor was undecided. Should he challenge the intruder or return home empty handed? To return would mean bitter defeat. The other young men of the tribe would laugh at his failure. He decided to creep up on the intruder and wait his chance.

The passage consisted of 17 sentences, 23 lines, and was divided into 48 pausal/idea units by a group of 23 University of Illinois undergraduate students. The procedure adopted for this division was the same as that used by Johnson (1970) and Brown and Smiley (1977). The students were told to read the story carefully and then re-read it putting a vertical slash

wherever they felt an idea unit had been completed or where they would pause while reading. An idea unit could consist of as little as a single word or extend over sentences. The final 48 units were agreed upon by 50% or more of the raters.

The forty-eight units were then rated by further independent undergraduates (N = 47) in terms of their importance to the theme of the passage. Again the procedure was modelled after that introduced by Johnson (1970) and modified by Brown and Smiley (1977). The raters were given the story printed with one previously identified unit on each line. They were asked to read the story carefully and then cross out the 12 units which were least essential to the theme of the story. This was repeated twice more until only 12 units remained, those judged most essential to the story theme. This rating procedure resulted in four levels of judged importance, the least important (1) being those units removed first and the most important (4) being those that remained at the end.

The only variation between this study and those previously reported was that the raters were divided into three groups. One-third of the raters were given an Eskimo orientation for the story, one-third were given an Indian orientation (see below) and the remainder were not oriented. No differences in rating distributions were found as a function of orientation and therefore the rating scores were pooled.

In addition to the rated story, three orientation books were prepared for the children. The booklets, commercially available photograph albums with clear plastic coverings on each page, contained pictures and short descriptive sentences concerning "peoples of other lands." The first booklet was comprised of pictures of the fictitious Targa people who were portrayed

as Eskimos. The second depicted the Targa as desert Indians and the third booklet was irrelevent to the Targa as the theme was the habits and habitat of Spanish people.

The story concerning the Eskimo Targa contained information including the following "facts": The Targa are a tribe of people who live in the north where it is very, very cold. In winter it is dark all the time. They spend much of their time protecting themselves against the cold. They are very brave hunters and live by hunting large animals like the polar bear and seal that live in their territory. They are very hospitable and good neighbors. They are very peaceful people and have never been known to engage in wars. The story concerning the Indian Targa contained these "facts": The Targa live in the south where it is very hot and very dry all year round and they spend most of their time trying to find water because there is always a drought. There are no animals to hunt, so they live on roots and berries. They are fierce and warlike, constantly waging war on their neighbors. Some people believe that they are head-hunters.

Procedure

The children were randomly divided into three groups, those to receive either the Eskimo, Indian or Spanish orientation. They were seen individually on two occasions, separated by approximately one week. On the first occasion they were introduced to the experimenter and were told that she was a student writing books about people of other lands. They were shown her "preliminary" orientation booklet about the fictitious Targa tribe and asked if they knew anything about people like them. In general they were engaged in conversation and read an orientation book concerning the Targa who were portrayed as either Eskimos or desert Indians. The control group received the same type

of orientation only their book was about the Spanish.

On the second meeting the children were told that we were interested in how well they could remember stories and what type of stories were easy for children of their age to remember. It was explained that if a story were interesting it would be easy for them to remember so we were going to try out some of our stories on them. They were told that the stories were about children from other lands. As a warm-up, all subjects listened to two recordings of the Epaminondas story and then attempted to recall the gist in their own words. In this practice session the features of gist recall were described and illustrated using the child's own recall attempt as an example. The target passage, Tor of the Targa, was then presented to all subjects with no mention of the prior orienting experience to the Targa tribe that the experimental subjects had received the previous week. Again the children listened to two recordings of the story and then attempted to recall the story in their own words. Their recall attempts were recorded.

When the child had indicated that he could recall no more he was asked a series of ten probe questions concerning elements of the story. Six of the probes were filler items requesting information concerning Tor's age, sex, and purpose. The four critical items probed ambiguous sections of the story. One asked the child to describe the weather, the second asked for a description of the hunting territory, the third asked for a full description of the prey, and the fourth asked about the rival hunter. After each probe question the child was asked to say whether the information was actually in the story or was just something he already knew about the Targa.

Results

The children's recall attempts were transcribed onto index cards and rated by two independent raters who were not aware of the age of the child or the experimental condition. First the raters scored each of the units of the story as present or absent, using a lenient criterion of gist recall. Next they isolated any intrusions included in the protocols but not in the original story. These intrusions were presented to two other naive judges who independently rated them as relevant to the Eskimo or Indian orientations or neutral with respect to either orientation.

First consider the number of actual units recalled as a function of age and the rated importance of the constituent units to the story theme. A 3 (Age) x 3 (Orientation: Eskimos, Indian and Spanish) x 4 (Importance levels) mixed analysis of variance was conducted on the recall data. The main effect of grade was reliable, F (2,81) = 9.60, $p < .001$ with the proportion of units recalled increasing with age (.41, .44, and .51, respectively for grades 2, 4, and 6). The main effect of orientation was also significant, F (2,81) - 16.03, $p < .001$. Those subjects receiving a relevant orientation recalled more units (.49 in both cases) than those receiving the irrelevant Spanish orientation (.38). The main effect of Importance was also reliable, F (3,243) = 260.52, $p < .001$ and recall increased as a function of the importance of the constituent units (.24, .27, .52, and .79 for levels 1-4 respectively).

Of interest is the significant Grade X Importance level interaction, F (6,243)= 3.02, $p < .005$, which is illustrated in Table 2. Confirming

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Insert Table 2 about here

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our previous findings (Brown,& Smiley, 1977; Smiley, Oakley, Worden, Campione, & Brown, 1977), the effect of age on recall is seen differentially across levels of importance. Although children at all grade levels recalled a great deal (approximately the same amount) of the most important units, recall at other levels of importance increased as a function of increasing chronological age. For all grades, however, the effect of importance units was reliable and there was a gradual increase in amount recalled as importance level increased.

Next we considered the proportion of units recalled which were judged to be intrusions. This proportion was low for each grade level and did not vary reliably as a function of Age (.14, .11, .09 for grades 2, 4, and 6) or of Orientation (.13, .12, .08 for Eskimo, Indian, and Spanish stories respectively).

The intrusions were next divided into those judged relevant to a theme and those judged irrelevant. There were no cases when a Spanish relevant intrusion was included so this condition was dropped from the analyses. In addition, there were no cases of cross-overs in that, for example, an Eskimo relevant intrusion occurred in an Indian oriented child's recall. The mean proportion of intrusions judged relevant to the orienting theme are presented in Table 3.

Insert Table 3 about here

At 3(Grade) x 2 (Orientation) factorial analysis of variance revealed a main effect of Age, F (2,50) = 7.37, p <.01 (The degrees of freedom were reduced by four as four subjects had no intrusions). The number of intrusions

which were judged relevant to the orienting theme increased as a function of age. Older children's intrusions were more likely to be theme related than younger children's, an age trend also found in Experiment 1. There was no significant effect attributable to either the Eskimo or Indian orientation.

The type of intrusions judged theme relevant are illustrated in Table 4. The entries refer to the proportion of protocols out of the possible 30 where

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Insert Table 4 about here

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such an intrusion occurred. The intrusion types are paraphrases of the original. The categories overlap so that one protocol could contain more than one intrusion type. As can be seen the intrusions centered around the background information the subjects had received concerning the Targa tribe and their habitat.

The answers to the probe questions indicated that the children were capable of making more of the critical inferences than appeared in their recall protocols. In Table 5 the proportion of replies that were rated as

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Insert Table 5 about here

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showing awareness are illustrated. An answer was judged aware if the subject indicated that (1) the terrain was desert or tundra, (2) the weather was extremely cold or extremely hot, (3) the prey was suitable for an Eskimo hunt or head-hunter, or (4) the trophy worn by the rival hunter was congruent with either story. Although some of the subjects in the Spanish orientation guess either very hot or very cold weather and desert or tundra terrains,

only one subject "guessed" that the prey was human and this same fourth grader also said the trophy was a shrunken head! For the subjects in the relevant orientations, the majority assumed the appropriate weather and terrain, but had more difficulty with the other two critical questions. The majority of children (83%) in the Eskimo orientation group "knew" the prey was a seal, polar bear, etc. but the Indian orientation group guessed less readily that the prey was human (47%). Similarly, the trophy worn by the hunter was not "known" by the majority of subjects. Only 41% of the Eskimo group "guessed" a seal skin etc., and only 30% of the Indian group guessed a relevant trophy such as heads, teeth, scalp, etc.

A comparison between Table 4 and 5 reveals that the number of children who "knew" certain facts about the weather and terrain as indicated in their answers to probe questions was much higher than the number of subjects who spontaneously added this material to their recall protocols. Note that 93% of subjects in the Eskimo condition answered that they knew that the weather was extremely cold but only 30% included such information in their recall. Finally, the great majority of children indicated that the material they "knew" about Tor was included in the story itself; that is, of the 28 subjects who said that the weather was extremely cold, 26 were sure that this information was explicitly mentioned in the story, indeed, 84% of all answers to probe questions were rated with high confidence as having been in the story, 87% of the answers to filler factual items (Tor was a boy, out hunting, etc.) and 80% of the answers to the critical four inference items. There were no apparent age trends in any of the inference data.

Discussion

Schemata provide the interpretative framework for comprehending discourse. Ambiguous or incomplete sections of a story are "filled-in" or

disambiguated so that the story more readily conforms to preexisting knowledge. As Bransford and McCarrell (1974) have argued, discourse does not carry meaning, it carries instructions for the construction of meaning. The dependence on contextual support in the comprehension processes is apparently just as strong in children as it is in adults.

Both experiments reported here are notable for the lack of strong developmental effects. Children from second to seventh grade all showed the same basic patterns that have been found previously with adults. Thus, young children, like adults, incorrectly identified congruent foils as part of the original story (Sulin & Dooling, 1974). They also reflect the biasing effects of prior expectation in their pattern of recall intrusions and, even more dramatically, in their responses to probe questions. Again these patterns have been found with adults (Anderson et al., 1976). The only suggestion of a developmental trend lies in the finding, repeated in both experiments, that the intrusions of older children are more likely to be theme relevant. Yet even the oldest children tested showed limited intrusions. Anderson et al. (1976) also report a dearth of intrusions in the recall protocols of adults and they stress how difficult it is to tell from an examination of recall what interpretation a subject has given to a passage. Although the majority of their adult subjects gave one distinct interpretation or another (as measured by questionnaire), to an ambiguous passage, one third of the recall protocols contained no indication of the underlying interpretation. In the second experiment reported here, it is noteworthy that although the majority of subjects made the inference that extreme weather meant desert or arctic conditions, and believed that weather details had occurred as part of the actual story, less than one half of the protocols showed evidence of this

"knowledge." In general, children behaved like adults and produced few indications in their recall of the interpretation they had given to a passage, an interpretation that was dramatically revealed in their post-recall interviews.

In terms of developmental trends, it appears that there is a tendency for older children to make more use of their background knowledge in recalling texts as suggested by Brown (1975); but the evidence is not overwhelming. Older children did, however, produce significantly more theme relevant intrusions and they did recall significantly more of the actual story units. However, the most striking aspect of the present studies is the lack of any compelling developmental differences in the basic findings. Children can and do use experimentally provided frameworks to disambiguate and embellish prose passages. Of interest is whether they are capable of spontaneously generating appropriate contexts from their own past experience in a deliberate attempt to aid the comprehension process. Training children to consciously generate appropriate contexts for material they must comprehend may be a fruitful mechanism for improving their comprehension of ambiguous materials.

It is an interesting point that the older children did produce more intrusions, and intrusions are technically errors. But these same children also recalled more of the actual units. This relationship between recall of actual units and embellishments and importations is interesting. In a sense the intrusions were creative errors in that they added to the cohesion and coherence of the story that was remembered and probably helped initially in rendering the material comprehensible. That young children also make these creative errors is encouraging for it suggests that a fruitful approach to aid reading comprehension would be to manipulate the preexisting knowledge of the world. For example, before giving a passage to be understood or

remembered, it should be helpful to excite the right background expectations, by providing pictures, precis, examples, or brief background descriptions, so that the child would be more likely to make inferences or creative errors when reading.

In this context, a major finding of the second experiment is that recall was better following the provision of a relevant framework than when no framework was provided, and this was true for all ages tested. Children with relevant, however scanty, background knowledge concerning the Targa tribe, recalled significantly more than those without the prior exposure. Considerable research with adults has also demonstrated this basic point: that meaning cannot be completely specified by the semantic content of discourse alone. One of the best examples is the considerable increase in recall of the "Modernday Romeo" passage in Bransford and Johnson (1973) where an appropriate pictorial context was provided. Bransford and his co-workers (Bransford & McCarrell, 1974) and Dooling and Lackman (1972) have also shown the beneficial effects of the presence of a theme-revealing title on discourse memory. It should be noted, however, that the passages used by Bransford and his colleagues (e.g., the Romeo passage), have typically been difficult to understand, and even incomprehensible in the absence of the contextual prompt. Here, the Tor passage was perfectly comprehensible without the enriching framework. Adults rated the importance units similarly whether or not they were given the background. And the students' recall was quite cohesive without the prior framework. The finding of a significant effect of prior background under these conservative conditions is particularly noteworthy.

The provision of an appropriate framework within which to incorporate a story leads to enhanced recall on a test passage given one week after the

orienting experience. The strength of the orienting effect on the probe test questions is particularly striking. The advantages for educational practice of providing setting conditions for the comprehension of texts are clear.

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We deeply regret the tragic death of Dr. Sandra Smiley, a close personal friend and highly valued collaborator.

Table 1

Examples of Relevant Intrusions in

the Galen/George Recall Protocols (verbatim)

George Theme

1. All these prison guards were chasing him.
2. About a guy who escaped from prison who was scared because the police were going to catch him.
3. He climbed over the prison walls.
4. He was running so the police would be so far away that their dogs would not catch his trail.
5. The dogs were beating their way through the forest.
6. The noise of their sirens screamed through the night.

Galen Theme

1. Story about Galen a monkey running away from the mean gorillas.
2. Galen couldn't fall behind because the gorillas would pick up his scent.
3. Galen swang on the trees so the gorillas couldn't catch him.
4. The gorillas are strong and Galen is weak but chimps are smarter so Galen will win.
5. If he can't stop for food he could eat plants but he needs water.
6. The ape was running away and he could hear the noisy gorillas riding after him (gorillas in the TV series had horses).

Table 2

Proportion of Units Recalled from the

Tor Story as a Function of Grade and Importance of the Units

Grade	Importance Level 1 (least)	2	3	4 (most)
Grade 2	.24	.19	.45	.76
Grade 4	.22	.31	.51	.76
Grade 6	.32	.30	.61	.79

Table 3

The Proportion of Intrusions Judged Relevant to the Orienting Condition for the Tor Story

Orientation	Eskimo	Indian	Total
Grade 2	.55	.47	.51
4	.64	.67	.66
6	.79	.79	.79

Table 4

Examples of Theme Revealing Intrusions (Paraphrased) for the Tor Story

Eskimo Orientation

Theme	Intrusion	Proportion & Protocols Showing Intrusion
1. Terrain	Snow and ice, ice flows, Hunting in a dog sled, Making a house of ice for protection, Wearing animal skins for protection.	.23
2. Weather	Icy, freezing, dark & cold	.30
3. Prey	Polar bears, seals, penguins, fish, bear.	.33
4. Trophy	Seal skins, bear skins, ivory, etc.	.03

Indian Orientation

Theme	Intrusion	Proportion & Protocols Showing Intrusion
1. Terrain	Desert, drought, no food, no water, sand.	.20
2. Weather	Hot, dry & hot, drought, sun, sunbaked, etc.	.46
3. Prey	Human, another Torga, an enemy.	.20
4. Trophy	Teeth, head, scalp, enemy's possessions, enemy's spear, enemy's bow and arrow.	.27

Table 5

Proportion of Subjects Giving Theme-Revealing Answers to the Critical Probe Questions Following the Tor Story

Orientation Question	Eskimo	Indian	Spanish
1. Terrain	.70	.83	.17
2. Weather	.93	.87	.20
3. Prey	.83	.47	.03
4. Trophy	.40	.30	.03